

PARASITIC WASPS OF THE GENUS *TETRASTICHUS* HALIDAY (HYMENOPTERA: EULOPHIDAE) FROM NORTHERN INDIA¹

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(With seventy-four text-figures)

Tetrastichus Haliday, 1843

Genotype: *Cirrospilus attatus* Walker by original designation [= *miser* (Nees)].

The genus *Tetrastichus* Haliday is a useful member of the Chalcidoidea which attacks a wide variety of hosts, including important pests of agriculture crops such as caterpillars, stem-borers, leaf miners, aphids, beetles, midges and thrips. The parasites attack different stages of the host including eggs, larvae, nymphs and pupae. They are either primary parasites or hyperparasites. Some species of *Tetrastichus* have also been reared as secondary parasites.

From India a good number of species have been described. In the present work five new species are being added to the known species of the genus *Tetrastichus* and three species are redescribed. (Type material is being deposited in Z.S.I., Calcutta, India). A key to some Indian species of the genus is also given.

KEY TO SOME INDIAN SPECIES OF THE GENUS *Tetrastichus* HALIDAY BASED ON FEMALES

1. Post marginal vein distinctly developed 2
- Post marginal vein completely absent 7
2. Body yellow or yellowish brown 4
- Body black 3
3. Frontovortex and face with scattered shallow punctations; eyes very sparsely pubescent; antennae brown, scape pale brown, only one ring segment present, club almost as long as preceding two funicle segments combined, scutellum finely longitudinally reticulate *T. krishnaiahi* Kaul and Saraswat
- Area of frons dorsad and laterad of scrobe cavity deeply punctured; eyes bare; antennae brown except club white and scape whitish with infuscation on dor-

- sal side, three ring segments present, club longer than preceding funicle segment; scutellum with microreticulate sculpture *T. chakrataensis* sp. nov.
4. Eyes black or dark red 5
 - Eyes silvery white, bare, scape slightly more than four times as long as wide, three ring segments present; funicle segments 1-3 subequal in length, each one and a half times as long as wide; mesoscutum with five setae near each parapsidal furrow, abdomen with five transverse brown bands on dorsum *T. flavidus* Khan and Shafee, 1981
 5. Eyes smooth, black in colouration, frontovortex smooth 6
 - Eyes pubescent, dark red; abdomen with transverse bands; frontovortex punctate, propodeum smooth, median carina and paraspiracular carina absent, propodeal spiracle touching the lateral margin *T. postmarginaloides* Saraswat
 6. Post ocellar line distinctly less than twice as long as ocellocular, antennae with only one ring segment, pedicel short, longer than wide, first funicle segment longer than wide, second segment shorter than first, quadrate, third segment transverse, wider than long, club almost as long as funicle segments 1-3 combined *T. mohani* sp. nov.
 - Post ocellar line greater than ocellocular, antennae with only two ring segments, pedicel twice as long as wide, first funicle segment a trifle less than twice as long as wide, second segment longer than first, less than twice as long as wide, third segment short, less than one and a half times as long as wide, club longer than preceding two funicle segments combined. *T. lotellae* Delucchi
 7. Body colouration dark brown or metallic 8
 - Body colouration yellow or yellowish brown 18
 8. Antennae with only one ring segment 9
 - Antennae with more than one ring segment 15
 9. Frontovortex punctate 10
 - Frontovortex smooth, without punctations 11
 10. Malar suture distinct; antennae dark brown, scape testaceous, pedicel short, distinctly longer than wide, two ring segments present, funicle segments 1-3 subequal in size, club almost as long as preceding two funicle segments together. *T. versicolor* Ranaweera, 1947

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- Malar suture absent, antennae dark brown except club white; pedicel long, more than twice as long as wide; only one ring segment present, first funicle segment elongated, less than twice as long as wide, second a trifle longer than wide, third greatly transverse, club longer than preceding two funicle segments combined *T. davidi* Khan *et al.*, 1986
11. Lower margin of clypeus with two dents medially . . . 12
 — Lower margin of clypeus without dents medially; eyes red; prominence between antennal sockets one-third the width of frons between eyes; antennae uniformly yellowish brown.
 *T. indicus* Khan and Shafee, 1981
12. Antennae dark brown except scape yellowish or infuscated 13
 — Antennae uniformly dark brown, except scape and pedicel white, prominence between antennal sockets more than one fifth the width of frons between eyes, subocular suture distinct, mandibles with an acute tooth and a truncation *T. partellus* sp. nov.
13. Mandibles tridentate 14
 — Mandibles bidentate, post ocellar line almost one and a half times as long as ocellular, prominence between antennal socket one fifth between the frons and eyes, malar suture absent, antennae dark brown except scape infuscated, pedicel distinctly less than twice as long as wide, mesopraescutum bearing one row of five setae at each lateral margin, third valvulae long, almost seven times as long as wide, distinctly less than one third the length of second valvifers
 *T. pyrillae* Crawford
14. Eyes reddish brown, prominence between antennal sockets one fourth the width of frons between eyes, malar space about as long as eye width, third valvulae short, triangular, less than twice as long as wide, about one fifth the length of second valvifers
 *T. aligarhensis* Khan and Shafee 1981
 — Eyes dark, prominence between antennal sockets less than one third the width of frons between eyes, malar space distinctly longer than eye width, third valvulae long, lanceolate, almost four times as long as wide, more than one third the length of second valvifers.
 *T. mangifera* sp. nov.
15. Antennae with four ring segments. 16
 — Antennae with only two or three ring segments . . . 17
16. Body very dark brown with metallic blue-green reflections; head without punctations; antennae brown with scape yellowish; legs pale yellow except fore coxae dark brown *T. dhireni* Saraswat
 — Body non metallic brown; head with shallow scattered punctations on vertex and face, antennae dark brown except scape yellowish brown; legs pale brown.
 *T. shencottensis* Saraswat
17. Scape, pedicel yellowish brown, funicle segments and club fuscous; only two ring segments present, legs pale cream except coxae and major part of femora dark *T. taprobanensis* Ranaweera, 1947
 — Antennae dark brown with yellow brown scape and pedicel; three ring segments present; legs testaceous except coxa and femora dark brown
 *T. niger* Ranaweera, 1947
18. Pedicel distinctly shorter or one-half to one-third the length of first funicle segment 19
 — Pedicel as long as first funicle segment or longer . . . 27
19. Antennae with one or two ring segments 20
 — Antennae with three or four ring segments 21
20. Antennae with only one ring segment, malar space shorter than eye width, mandibles with two teeth and truncation, scape three times longer than wide, basal vein with five setae, speculum closed below, third valvulae very long almost nine times as wide, distinctly less than one-third the length of second valvifers *T. pantnagarensis* Khan, 1983
 — Antennae with two ring segments, malar space longer than eye width, mandibles tridentate with acute teeth; scape more than five times as long as wide; basal vein with three setae, speculum large and open below, third valvulae short, five times as long as wide, less than one fourth of the second valvifers
 *T. misellus* Delucchi
21. Four ring segments present 22
 — Only three ring segments present 23
22. Antennae about half the body; pedicel almost one-third the length of first funicle segment; first funicle segment very long, almost eight times as long as wide; three mesoscutal bristles present, median longitudinal groove on mesonotum faint.
 *T. tritrichia* Saraswat
 — Antennae less than half the body; pedicel not likewise, distinctly shorter than first funicle segment, first funicle segment almost two and a half times as long as wide; 11 mesoscutal bristles present, median longitudinal groove on mesonotum distinct.
 *T. polyseta* Saraswat
23. Antennae not uniformly yellow 24
 — Antennae uniformly yellow; eyes red with six dark patches; scape slightly less than four times as long as wide, as long as basal two funicle segments together, funicle segments 1-3 subequal in length, body completely yellow except apex of ovipositor infuscated; middle tibial spur as long as basitarsus; third valvulae four times as long as wide; one-fourth the length of second valvifers, outer plates of ovipositor as long as second valvifers . . . *T. psyllidis* Khan and Shafee, 1981

24. Lower margin of clypeus with two dents medially . . . 25
 — Lower margin of clypeus without dents medially; two dark spots below the front ocellus present; club two-segmented; thorax light reddish brown; slightly broader than head, legs yellowish brown; submarginal vein approximately equal to marginal vein; stigmal vein about one-fourth the marginal vein; ovipositor sub-exserted *T. lasiopterae* Bhatnagar, 1951
25. Frontovertex and thorax without any punctations . . . 26
 — Frontovertex, mesoscutum and scutellum with punctations; eyes and ocelli brownish red to reddish brown; antennae dark brown; legs yellowish brown except middle coxae completely, hind coxae basally and last tarsal segment of all the legs dark brown *T. malabarensis* Saraswat
26. Head yellowish brown, vertex and bases of ocelli dark brown, eyes reddish brown, antennae black except scape yellowish brown; legs yellowish except last tarsal segment of all the legs dark brown; pedicel distinctly less than one-half the length of first funicle segment *T. bicolor* Saraswat
 — Head very dark brown, rest of the body yellowish brown; eyes red; antennae brown except scape and pedicel yellowish brown; legs brownish yellow except hind coxae on basal half black; pedicel not likewise but distinctly shorter than first funicle segment. *T. satpurensis* Saraswat
27. Eyes red or black 28
 — Eyes silvery white; prominence between antennal sockets one-sixth the width of frons between eyes; antennae yellowish; scape three and a half times as long as wide; pedicel one and a half times as long as wide, two ring segments present; funicle segments 1-3 slightly longer than wide; third valvulae three and a half times as long as wide; one-third the length of second valvifers, outer plates of ovipositor slightly longer than second valvifers *T. ajmerensis* Khan and Shafee, 1981
28. Thorax yellowish brown; prominence between antennal sockets one-fifth the width of frons between eyes; mesoscutum with five setae near each parapsidal furrow, third valvulae six times as long as wide, more than one-third the length of second valvifers, outer plates of ovipositor as long as second valvifers *T. annulicornis* Khan and Shafee, 1981
 — Thorax brown with reddish yellow admixture; prominence between antennal sockets distinctly more than one-fourth the width of frons between eyes; mesopraescutum bearing a single seta at each lateral margin, third valvulae less than six times as long as wide, slightly more than one-third the length of second valvifers, outer plates of ovipositor distinctly

shorter than second valvifers *T. obliqua* sp. nov.

***Tetrastichus mohani* sp. nov.³**

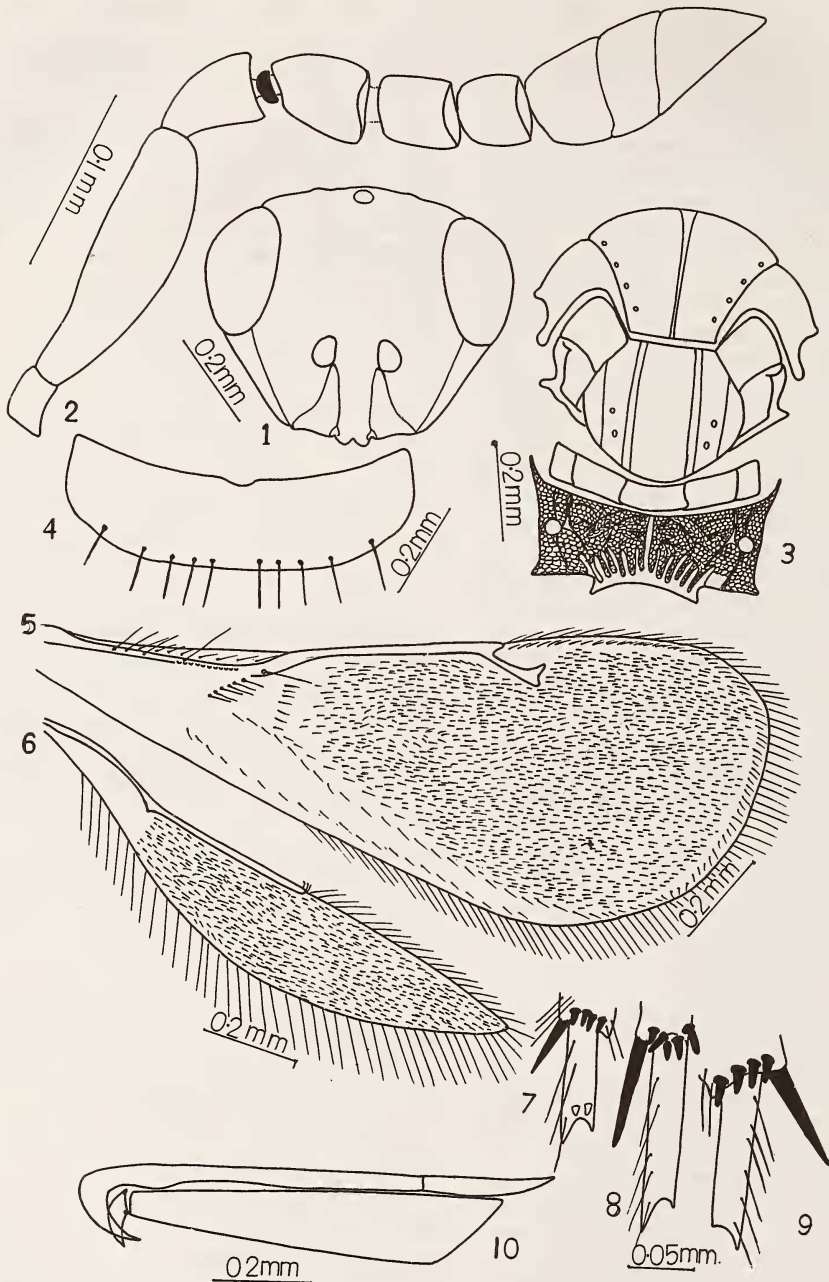
(Figs. 1-10)

Head (Fig. 1): Reddish brown, with very faint iridescent blue lustre, wider than long in facial view (0.64:0.52), frontovertex much wider, more than one-half the total head width (0.33:0.64); ocelli white, arranged in an obtuse angle triangle, post ocellar line distinctly less than twice as long as ocellular; eyes black and smooth; antennae inserted just above the lower level of eyes; prominence between antennal sockets one-fourth the width of frons between eyes; malar space longer than eye width (0.21:0.14); malar suture distinct; lower margin of clypeus with two dents medially; mandibles tridentate, maxillary and labial palpi each segmented.

Antennae (Fig. 2): Yellowish brown except the scape whitish, 8-segmented excluding one ring segment; scape less than four times as long as wide (0.14:0.04), pedicel short, longer than wide (0.05:0.035), as long as first funicle segment, funicle 3-segmented, first funicle segment longer than wide (0.05:0.04), second segment shorter than first, quadrate (0.04:0.04), third segment transverse, wider than long (0.042:0.035), club 3-segmented, less than thrice as long as wide (0.13:0.055), almost as long as funicle segments 1-3 combined.

Thorax (Fig. 3): Reddish brown with very faint iridescent blue lustre; pronotum with posterior margin slightly concave with six pairs of setae, anterior margin concave in the middle (Fig. 4), mesoscutum distinctly more than twice as wide as long (0.6:0.26); parapsidal furrows complete, mesopraescutum bearing one row of four bristles at each lateral margin, median furrow present; scutellum wider than long (0.34:0.28), with two submedian grooves and two pairs of setae, posterior margin rounded,

³This species is named after Prof. Man Mohan Agarwal in recognition of his valuable contributions to our knowledge of Chalcidoidea.



Figs. 1-10. *Tetrastichus mohani* sp. nov.

1. Head, facial view; 2. Antenna; 3. Thorax; 4. Pronotum; 5. Forewing; 6. Hind wing; 7. Part of foreleg; 8. Part of middle leg; 9. Part of hind leg; 10. Ovipositor.

mesopostphragma not reaching beyond the propodeum; surface of propodeum with fine reticulate sculpture, strong mesal and paraspiracular carinae present and a series of short carinae radiating latero-anteriorad from posterior margin, a number of vague wrinkles present on propodeal surface, spiracles well separated from the anterior margin of propodeum.

Forewings (Fig. 5): Hyaline, less than thrice as long as wide (1.47:0.57), densely setose, rounded apically; costal cell broad with a ventral line of eight setae, basal vein with six setae, basal cell bare, speculum moderate and closed below, cubital vein sinuate, subcubital line of hairs starting from a distance about one-fourth distance from base; submarginal vein (0.46) with four strong setae, longer than marginal vein (0.4), postmarginal vein very short (0.02), stigmal vein (0.1) one-fourth the marginal vein, marginal fringe short.

Hind wings (Fig. 6): Hyaline; acute at apex, less than six times as long as wide (1.1:0.2); marginal fringe at posterior margin long, one half width of wing at hamuli.

Forelegs (Fig. 7): Yellowish except coxae, trochanter and femora infuscated; tibial spur short, apical rim of tibiae with four small pegs; basitarsus, second and third tarsal segments with two pegs on each.

Middle legs (Fig. 8): Uniformly yellowish, tibial spur long, more than half the length of basitarsus; apical rim of tibiae with five distinct pegs.

Hind legs (Fig. 9): Uniformly yellowish except coxae slightly infuscated at basal tip; tibial spur a trifle more than half the length of basal tarsus; apical rim of tibiae with four distinct pegs.

Abdomen: Reddish brown with very faint iridescent blue lustre; as long as head and thorax together; ovipositor arising from apical one-third of abdominal venter; third valvulae (Fig. 10) moderate in size, lanceolate, less than seven times as long as wide, less than one-third the

length of second valvifers (Fig. 10), outer plates of ovipositor (Fig. 10) longer than second valvifers.

Holotype: Female, INDIA, U.P. – Nainital, Pantnagar, ex. Agromyzid leaf mine (unidentified) on wild plant, 7 August, 1987 (M. A. Khan).

Paratype: Five females, same data as holotype.

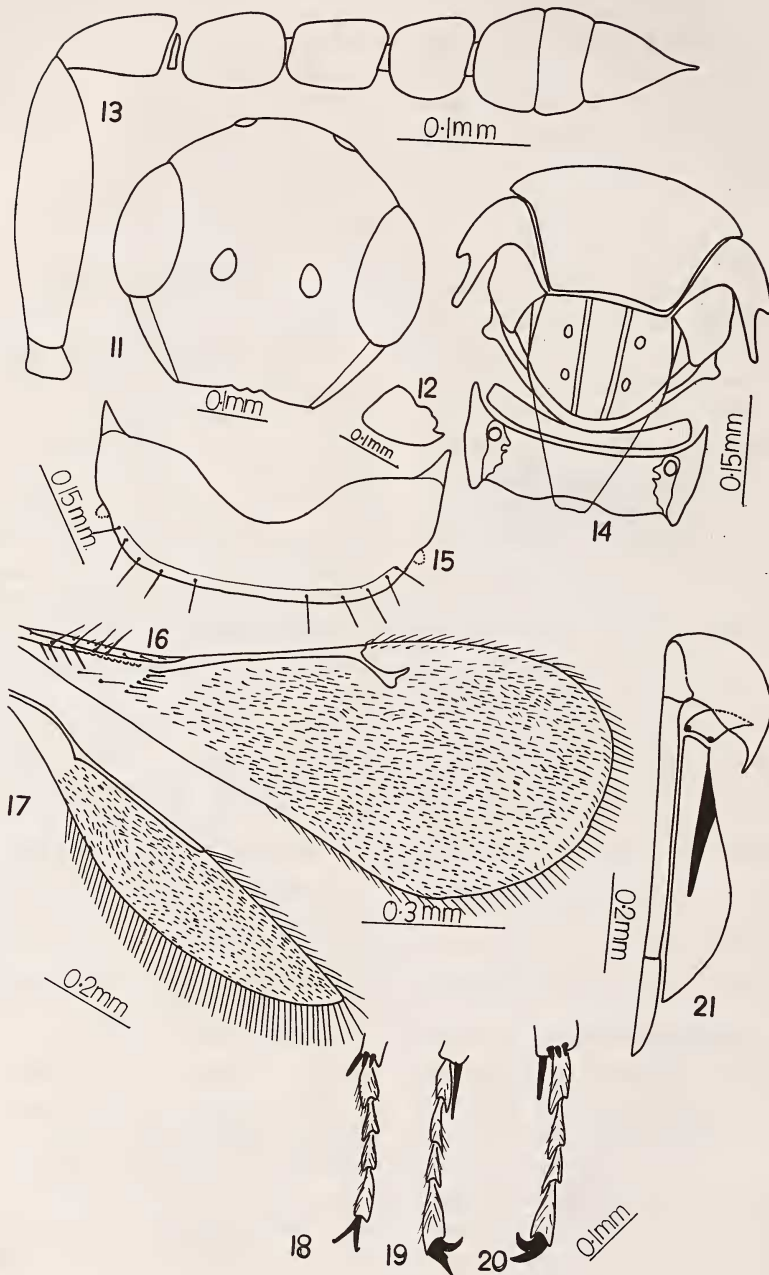
***Tetrastichus mangifera* sp. nov.**

(Figs. 11-21)

Head (Fig. 11): Dark with lower half of frontovertex, clypeus and malar space light yellowish, roundish, slightly wider than long in facial view (0.46:0.41); frontovertex much wider, more than one-half the total head width (0.26:0.46), ocelli dark, arranged in obtuse triangle; postocellar line slightly longer than ocellular; eyes dark and smooth, antennae inserted well above the lower level of eyes; prominence between antennal sockets less than one-third the width of frons between eyes (0.1:0.26); malar space distinctly longer than eye width (0.14:0.09); malar suture distinct; lower margin of clypeus with two dents medially; mandibles tridentate (Fig. 12) maxillary and labial palpi each 1-segmented.

Antennae (Fig. 13): Dark except pedicel and scape yellowish with infuscations; 8-segmented excluding one ring segment; scape less than four times as long as wide (0.22:0.06); almost as long as three funicle segments together; pedicel less than twice as long as wide (0.09:0.05), distinctly longer than first funicle segment; funicle 3-segmented, segments 1-3 gradually decreasing in length distad; first funicle segment longer than wide (0.08:0.06); longer than second segment (0.07:0.06), third as long as wide (0.065:0.065); club 3-segmented, more than twice as long as wide (0.17:0.08), longer than preceding two funicle segments together.

Thorax (Fig. 14): Dark; non-iridescent; mesoscutum less than thrice as wide as long



Figs. 11-21. *Tetrastichus mangifera* sp. nov.

11. Head, facial view; 12. Mandible; 13. Antenna; 14. Thorax; 15. Pronotum; 16. Forewing; 17. Hind wing; 18. Part of foreleg; 19. Part of middle leg; 20. Part of hind leg; 21. Ovipositor.

(0.07:0.17), mesopraescutum twice as wide as long (0.34:0.17), with a row of five bristles at each lateral margin; scutellum wider than long with two submedian grooves and two pairs of setae with longitudinal striations; posterior margin rounded; mesopostphragma reaching beyond the propodeum; propodeum with strong mesal and paraspiracular carinae, spiracle almost touching the anterior margin of propodeum.

Forewings (Fig. 16): Hyaline; more than twice as long as wide (1.22:0.51); apex broadly rounded; costal cell with four setae, shorter than marginal vein; basal vein with five setae, basal area with two setae; cubital vein straight; speculum narrow, closed below; submarginal vein with four strong setae directed apically and four setae directed backwards; shorter (0.32) than marginal vein (0.35); postmarginal vein rudimentary; stigmal vein short (0.1); marginal fringe short.

Hind wings (Fig. 17): Hyaline, almost six times as long as wide, acute at apex; marginal fringe long.

Forelegs (Fig. 18): Uniformly yellowish except last tarsal segment infuscated; tibial spur short, apical rim of tibiae with three pegs.

Middle legs (Fig. 19): Uniformly yellowish except coxae and last tarsal segment infuscated; tibial spur longer than basitarsus; apical rim of tibiae with three pegs.

Hind legs (Fig. 20): Uniformly honey yellowish except coxae with a black spot on dorsal side and pretarsus with apical end infuscated; coxae, femora and tibiae compressed; tibial spur shorter than basitarsus, apical rim of tibiae with two pegs.

Abdomen (Fig. 21): Dark except basal one-third which is yellow; longer than thorax; ovipositor concealed, arising from base of abdominal venter; first valvifers semicircular (Fig. 21); second valvifers long and narrow, more or less of uniform width; anterior margin of basal part typically very large and much curved (Fig. 21), U-shaped; third valvulae almost four times as long as wide; more than one-third the second

valvifers (Fig. 21), outer plates of ovipositor distinctly shorter than second valvifers.

Length of female: 1.12 mm.

Holotype: Female, INDIA, U. P. – Nainital, Pantnagar, ex. Coccids (unidentified) on *Mangifera indica*, 10 August, 1987 (M.A. Khan).

Paratype: Two females, same data as holotype.

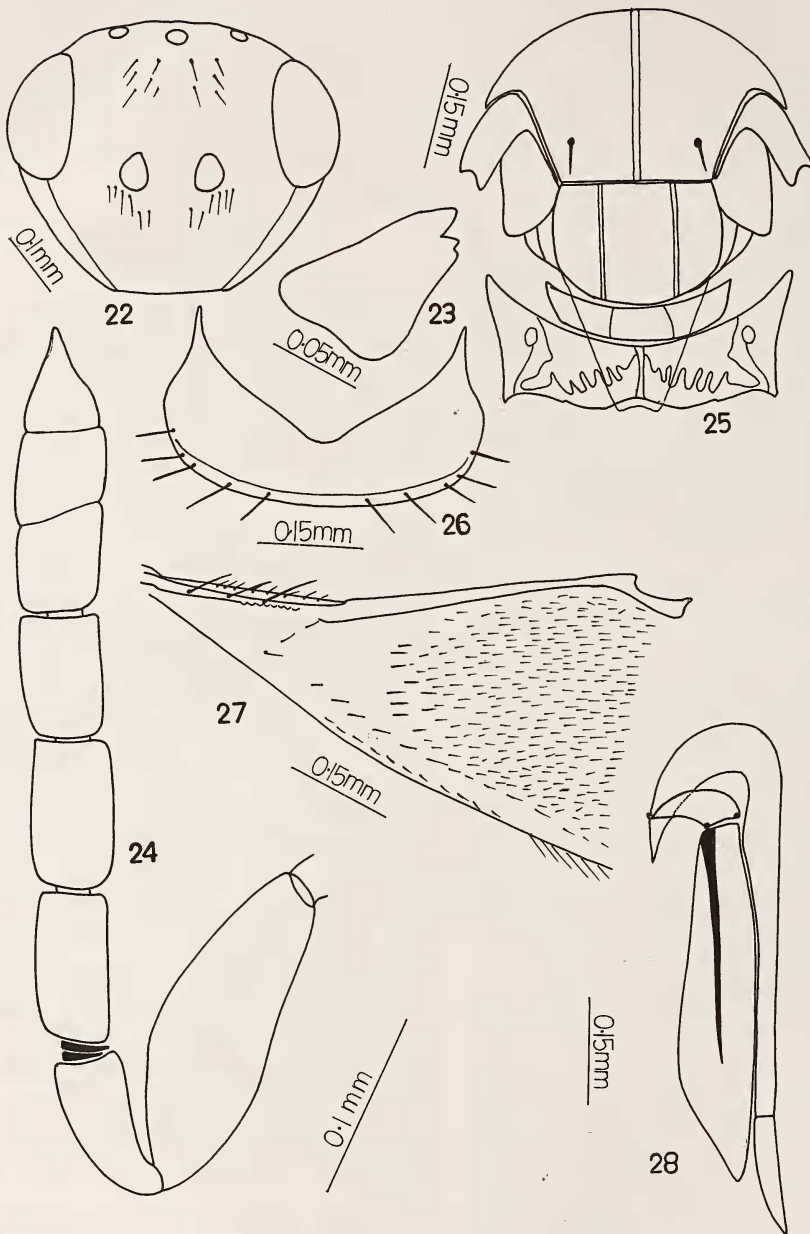
***Tetrastichus obliqua* sp. nov.**

(Figs. 22-28)

Head (Fig. 22): Completely yellowish brown; setose, setae dark brown, arranged in two rows at frons and a single row just below antennal sockets; wider than long (0.48:0.4); frontovertex wide, more than one-half the total head width (0.28:0.48); ocelli red, arranged in obtuse triangle, postocellar line one and a half times as long as ocellular; eyes black and smooth; antennae inserted at lower level of eyes; prominence between antennal sockets distinctly more than one-fourth the width of frons between eyes (0.06:0.28); malar space very long, almost twice the eye width (0.19:0.1); malar suture distinct; lower margin of clypeus without dents medially; mandibles (Fig. 23) tridentate; maxillary and labial palpi each 1-segmented.

Antennae (Fig. 24): Uniformly yellowish, densely setose; 8-segmented excluding two ring segments; scape flattened, less than thrice as long as wide (0.16:0.06); pedicel long, twice as long as wide (0.08:0.04), as long as first funicle segment; first segment twice as long as wide (0.08:0.04), second segment as long as first but less than twice as long as wide (0.08:0.45), third short, less than one and a half times as long as wide (0.06:0.045); club 3-segmented, more than thrice as long as wide (0.14:0.45), slightly longer than preceding two funicle segments together.

Thorax (Fig. 25): Brown with reddish yellow admixture; pronotum (Fig. 26) with posterior submarginal ridge bearing five pairs of setae, antero-lateral arms slightly long and narrow; mesoscutum more than twice as wide as

Figs. 22-28. *Tetrastichus obliqua* sp. nov.

22. Head, facial view; 23. Mandible; 24. Antenna; 25. Thorax; 26. Pronotum; 27. Forewing (part); 28. Ovipositor.

long (0.52:0.24), mesopraescutum bearing a single seta at each lateral margin, middle longitudinal groove present; scutellum shorter than mesoscutum, more than twice as long as wide (0.38:0.18), with two submedian grooves and two pairs of setae; surface of propodeum smooth; median, paraspircular and oblique carinae present, mesal length of propodeum less than one-third length of scutellum, propodeal spiracles separated from anterior margin by a space more than one-half as great as length of a spiracle; mesopostphragma reaching well beyond the propodeum.

Forewings (Fig. 27): Hyaline; venation very light yellow; more than twice as long as wide (1.2:0.52), costal cell narrow with eight small setae; basal vein with three setae; basal cell bare; speculum of moderate size, open below; submarginal vein (0.26) with three strong setae, less than twice the length of marginal vein (0.44); postmarginal vein absent; stigmal vein short, almost one-fifth the length of marginal vein.

Legs: Yellow except fore coxae brown, middle tibial spur distinctly shorter than basitarsus.

Abdomen (Fig. 28): Brown with yellowish reflections; longer than head and thorax together; ovipositor exerted; first valvifers (Fig. 28) semicircular; anterior margin of basal part of second valvifers much curved and U-shaped (Fig. 28); third valvulae less than six times as long as wide, slightly more than one-third the length of second valvifers (Fig. 28); outer plates of ovipositor (Fig. 28) distinctly shorter than second valvifers.

Length of female: 1.24 mm.

Holotype: Female, INDIA, U.P. – Nainital, Pantnagar, ex. pupa of *Spilosoma obliqua* (Lepidoptera: Arctidae) on *Glycine max*, 10 October, 1987 (M. A. Khan).

Paratype: Six females, same data as holotype.

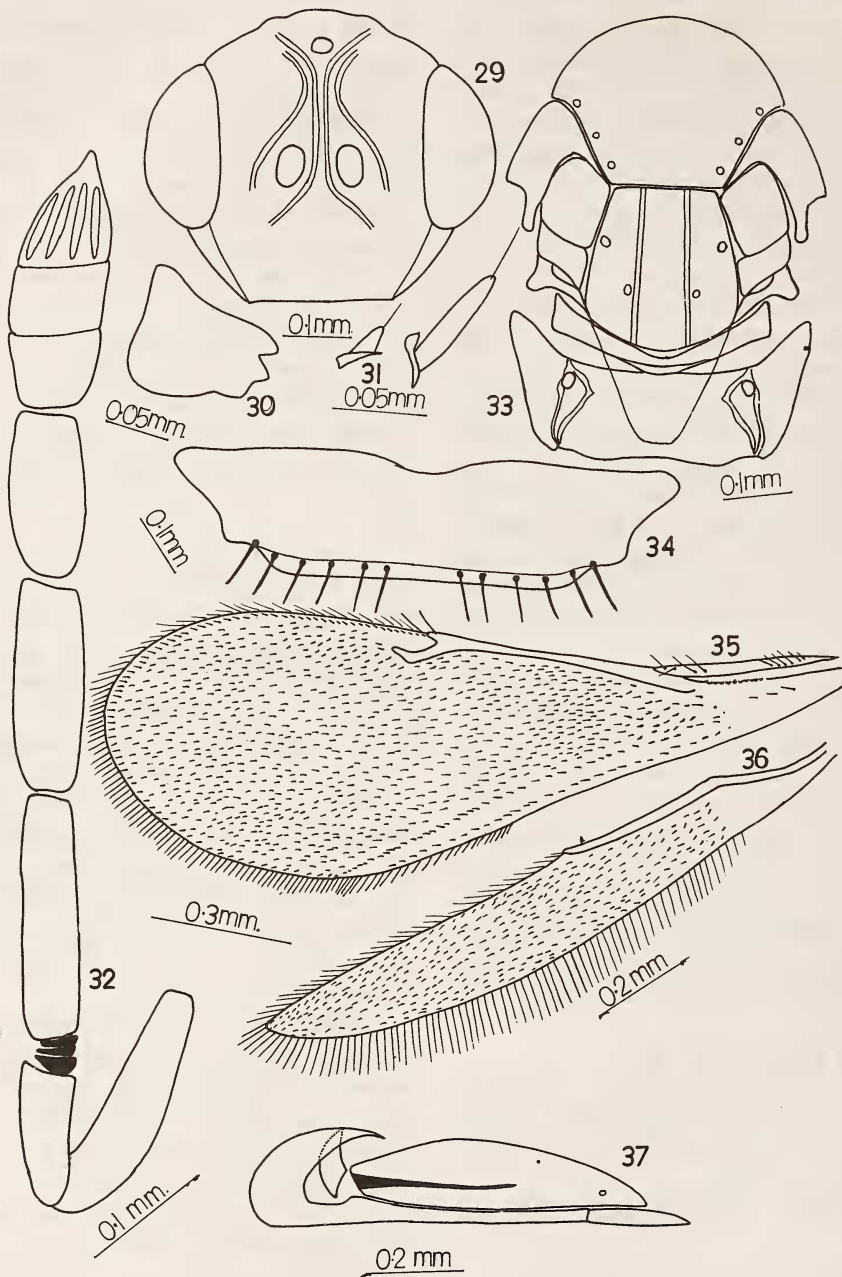
Tetrastichus chakrataensis sp. nov.
(Figs. 29-37)

Head (Fig. 29): Dark brown with strong

iridescent bluish lustre; area of frons dorsad and laterad of scrobe cavity deeply punctured, area immediately ventrad of antennae bases shagreened; fracture at ventral margin of compound eye obscure, small, wider than long in facial view (0.52:0.43); frontovertex width distinctly more than one-half the total head width (0.3:0.52), ocelli reddish, arranged in obtuse triangle, postocellar line more than as long as ocellocular; eyes bare, antennae inserted almost at the middle, prominence between antennal sockets less than one-seventh the width of frons between eyes (0.045:0.03); malar space longer than eye width (0.12:0.1); malar suture distinct; lower margin of clypeus without dents medially; mandibles (Fig. 30) tridentate, maxillary and labial palpi each 1-segmented (Fig. 31).

Antennae (Fig. 32): Brown except club white, scape whitish with infuscation on dorsal side, 8-segmented excluding three ring segments; scape cylindrical, more than four times as long as wide (0.17:0.04), pedicel two and a half times as long as wide (0.1:0.4); more than half the length of first funicle segment; funicle 3-segmented, segments gradually decreasing in length and increasing in width distad; first funicle segment more than four times as long as wide (0.164:0.04), second less than thrice as long as wide (0.14:0.05) third twice as long as wide (0.12:0.06); club 3-segmented, less than thrice as long as wide (0.18:0.07), longer than preceding funicle segment.

Thorax (Fig. 33): Dark brown with strong iridescent bluish lustre; pronotum (Fig. 34) with posterior submarginal ridge bearing six pairs of setae, antero-lateral angles obtuse and laterally directed; mesoscutum less than twice as wide as long (0.46:0.25), mesopraescutum bearing one row of bristles at each lateral margin; scutellum longer than wide (0.25:0.2), with two submedian longitudinal grooves and two pairs of setae, posterior margin rounded; mesopostphragma not reaching beyond the propodeum, surface of propodeum shagreened, strong mesal and



Figs. 29-37. *Teirastichus chakrataensis* sp. nov.

29. Head, facial view; 30. Mandible; 31. Maxillary and labial palpi; 32. Antenna; 33. Thorax; 34. Pronotum; 35. Forewing; 36. Hind wing; 37. Ovipositor.

paraspicular carinae present, propodeal spiracles separated from anterior margin by a space one-half as great as length of a spiracle.

Forewings (Fig. 35): Hyaline, less than thrice as long as wide (1.46:0.53); disc densely setose; costal cell short and narrow, with a row of six small setae at basal half and four long setae at apical end; basal vein with four setae; basal cell setose; cubital vein straight, speculum absent; submarginal vein with two long setae, much shorter (0.38) than marginal vein (0.45), postmarginal vein very short (0.02), stigmal vein (0.11) more than one-fourth the length of marginal vein; marginal fringe short.

Hind wings (Fig. 36): Hyaline, less than seven times as long as wide (1.24:0.19), densely setose; marginal fringe long.

Legs: Uniformly yellow except coxae brown and tarsal segments 3-4 infuscated, middle and hind tibial spur shorter than respective basitarsus.

Abdomen: Brownish with metallic reflections; longer than thorax; ovipositor arising from basal one-third of abdominal venter; first valvifers semicircular; anterior margin of basal part of second valvifers much curved (Fig. 37); third valvulae less than six times as long as wide, more than one-third the length of second valvifers; outer plate of ovipositor (Fig. 37) distinctly shorter than second valvifers, submarginal plate (Fig. 37) broad, posterior margin with a notch in the middle.

Length of female: 1.41 mm.

Holotype: Female, INDIA, U.P. – Chakrata (2745 m), ex. Lepidopterous leafmine (unidentified) on wild plant, 4 May, 1986 (M. A. Khan).

Paratype: Two females, same data as holotype.

***Tetrastichus partellus* sp. nov.**

(Figs. 38-48)

Head (Fig. 38): Dark brown with varying degree of metallic green; iridescent; wider than long (0.58:0.47), frontovertex much wider, distinctly more than one-half the total head width

(0.34:0.58), antennae inserted just above the line drawn across lower level of eyes; prominence between antennal sockets more than one-fifth the width of frons between eyes (0.06:0.34); subocular suture distinct, mandibles bidentate (Fig. 39) with an acute tooth and truncation.

Antennae (Fig. 41): Uniformly dark brown with scape and pedicel white, 8-segmented excluding one ring segment; scape cylindrical, less than five times as long as wide (0.21:0.045); pedicel distinctly less than twice as long as wide (0.07:0.45), shorter than first funicle segment; first funicle segment longer than wide (0.08:0.065), second segment shortest, a trifle longer than wide (0.07:0.065), third segment longest, distinctly longer than wide (0.09:0.065), club 3-segmented, more than thrice as long as wide (0.23:0.07), a trifle shorter than funicle segments 1-3 together; funicle segment 1 to last club segments with 5, 4, 5, 6 and 3 sensoria respectively.

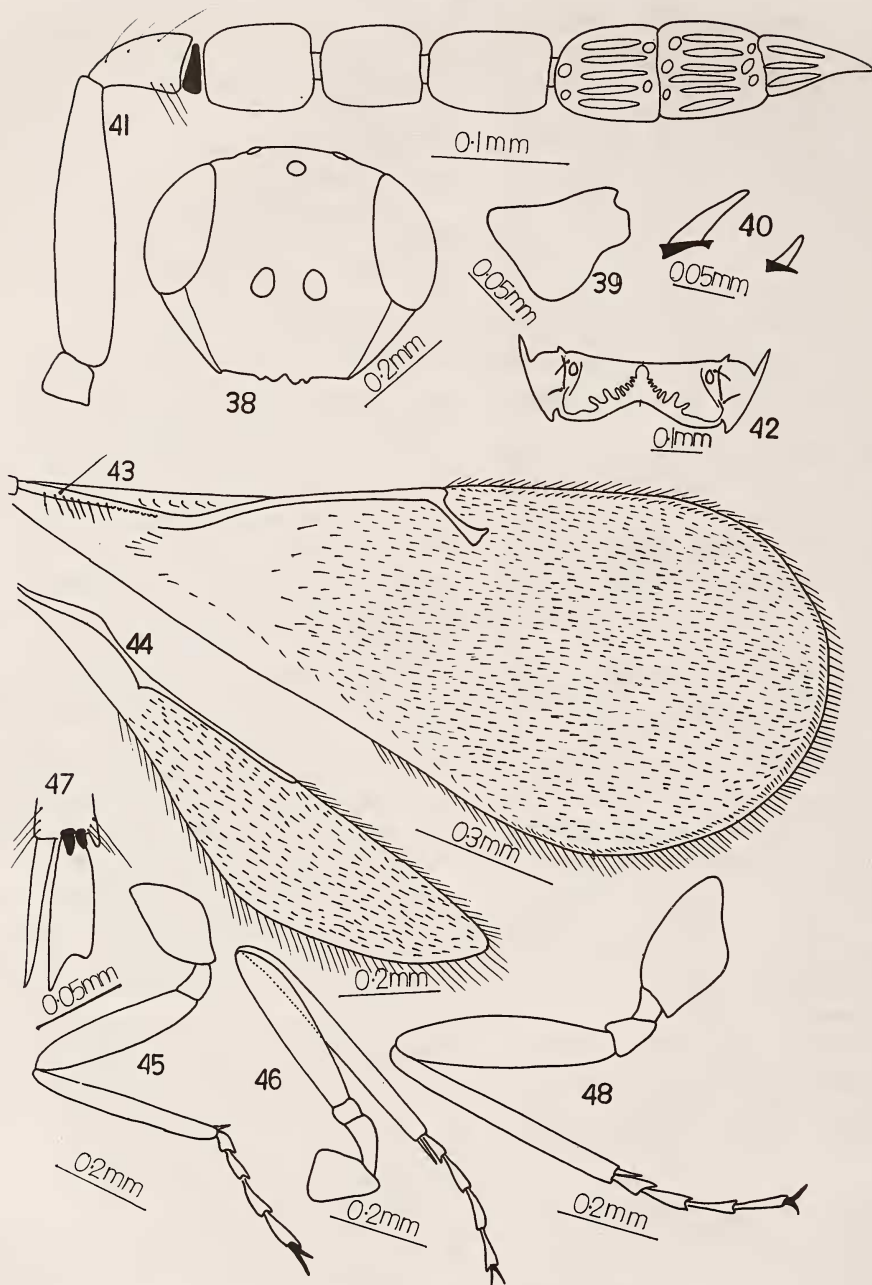
Thorax: Dark brown with metallic green iridescence; surface of propodeum (Fig. 42) reticulate, median paraspicular and oblique carinae present, mesal length of propodeum one-third length of scutellum; propodeal spiracle separated from anterior margin by a space almost as great as length of a spiracle.

Forewings: (Fig. 43): Hyaline, venation dark brown; more than twice as long as wide; costal cell broad, with six setae arranged in a row; submarginal vein with a long seta directed upwards and setae in a row directed downwards; submarginal vein (0.46) longer than marginal vein (0.38); postmarginal vein rudimentary; stigmal vein (0.1) almost one-fourth the marginal vein; marginal fringe long, spaced by a distance equal to almost one-fourth length of a fringe.

Hind wings (Fig. 44): Hyaline, blunt at apex; more than four times as long as wide.

Forelegs (Fig. 45): Uniformly dark brown except tibiae tan; tarsal segments 1-4 light brown.

Middle legs (Fig. 46): Uniformly dark brown except tibiae at apical one-third and first



Figs. 38-48. *Tetrastichus partellus* sp. nov.

38. Head, facial view; 39. Mandible; 40. Maxillary and labial palpi; 41. Antenna; 42. Propodeum; 43. Forewing; 44. Hind wing; 45. Foreleg; 46. Middle leg; 47. Part of middle leg; 48. Hind leg.

tarsal segment yellowish, tarsal segments 2-4 light brown, tibial spur long, as long as basitarsus, apical rim of tibiae (Fig. 47) with two stout pegs.

Hind legs (Fig. 48): Colouration same as that of middle legs.

Abdomen: Dark brown with metallic green iridescence; shorter than thorax; ovipositor almost concealed.

Length of female: 1.42 mm.

Holotype: Female, INDIA, U.P. – Nainital, Pantnagar, ex. Pupae of *Chilo partellus* (Lepidoptera: Crambidae) on *Zea mays*, 20 October, 1987 (M. A. Khan).

Paratype: Two females, same data as holotype.

***Tetrastichus pyrrillae* Crawford**
(Figs. 49-54)

Head (Fig. 49): Dark brown with yellowish reflections on frons; wider than long in facial view (0.56:0.48); frontovertex much wider, more than one-half the total head width (0.3:0.56); ocelli white, arranged in obtuse triangle, postocellar line almost one and one-half times as long as ocellular; areas of frons laterad and dorsad of scrobe cavity with well marked transverse reticulations; eyes dark and smooth; antennae inserted well above lower level of eyes; prominence between antennal sockets one-fifth the width of frons between eyes (0.06:0.3); malar space longer than eye width (0.18:0.13); malar suture absent; lower margin of clypeus without dents medially; mandibles bidentate (Fig. 49) with acute teeth; maxillary and labial palpi each 1-segmented.

Antennae (Fig. 50): Dark brown except scape infuscated; 8-segmented excluding one ring segment; scape cylindrical, more than four times as long as wide (0.22:0.05); pedicel distinctly less than twice as long as wide (0.08:0.05); funicle 3-segmented; first funicle segment almost twice as long as wide (0.12:0.065), second distinctly less than twice as

long as wide (0.11:0.065), third segment less than one and a half times as long as wide (0.115:0.08), distinctly wider than second segment; club 3-segmented, more than twice as long as wide (0.22:0.09), shorter than preceding two funicle segments together.

Thorax (Fig. 51): Dark brown; pronotum (Fig. 52) with posterior submarginal ridge bearing six pairs of setae, antero-lateral angles obtuse and laterally directed; mesoscutum more than two times wider than long (0.48:0.23); mesopraescutum bearing one row of five setae at each lateral margin; scutellum wider than long (0.25:0.22), shorter than mesoscutum; propodeum shagreened, lateral carinae present.

Forewings (Fig. 53): Hyaline; venation infuscated, more than twice as long as wide (1.4:0.68); costal cell narrow, bare; basal vein with five setae; basal cell bare, open; speculum moderate, closed below; cubital vein straight; subcubital line of hairs short, starting from one-third the distance from base; submarginal vein (0.38) with a single seta, as long as marginal vein (0.38); postmarginal vein rudimentary; stigmal vein (0.13) almost one-third the length of marginal vein; marginal fringe short.

Hind wings: Hyaline, less than six times as long as wide; marginal fringe long.

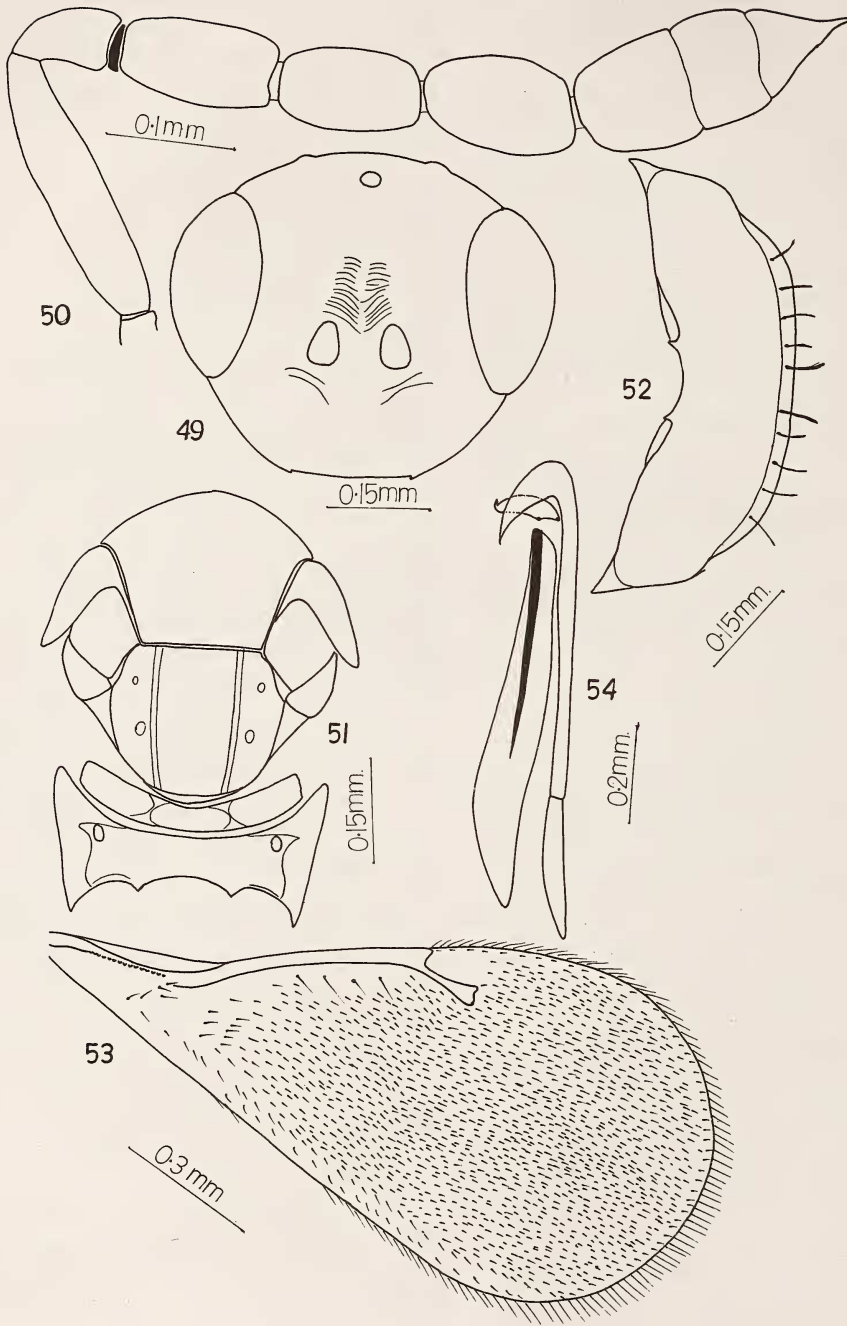
Legs: Dark brown except apex of femora, tibiae and tarsal segments 1-4 yellowish.

Abdomen: Dark brown with metallic reflections; longer than thorax; ovipositor arising from base of abdominal venter; third valvulae (Fig. 54) long, almost seven times as long as wide, distinctly less than one-third the length of second valvifers (Fig. 54); outer plates of ovipositor (Fig. 54) longer than second valvifers.

Length of female: 1.42 mm.

Male: Not known.

Material examined: Six females, INDIA, U.P. – Nainital, Pantnagar, ex. eggs of *Pyrrilla perpusilla* on sugarcane, 20 August, 1987 (S. N. Sushil).



Figs. 49-54. *Tetrastichus pyrillae* Crawford
 49. Head, facial view; 50. Antenna; 51. Thorax; 52. Pronotum; 53. Forewing; 54. Ovipositor.

***Tetrastichus lotellae* Delucchi**
(Figs. 55-63)

Head (Fig. 55): Yellowish brown; wider than long in facial view (0.48:0.41); frontoververtex less than one-half the total head width (0.23:0.48); ocelli red, arranged in obtuse triangle, post ocellar line greater than ocellular; eyes black, smooth; prominence between antennal sockets more than one-fourth the width of frons between eyes (0.055:0.23); malar space longer than eye width (0.13:0.12); antennae inserted well above the lower level of eyes; malar suture distinct; lower margin of clypeus without dents medially; mandibles tridentate (Fig. 56); maxillary and labial palpi each 1-segmented (Fig. 57).

Antennae (Fig. 58): Uniformly yellowish with infuscation; 8-segmented excluding two ring segments; scape cylindrical, more than four times as long as wide (0.21:0.05); pedicel twice as long as wide (0.08:0.04), as long as first funicle segment; funicle 3-segmented; first funicle segment a trifle less than twice as long as wide (0.08:0.045), second longer than first segment, less than twice as long as wide (0.09:0.051), third segment short, less than one and a half times as long as wide (0.07:0.05); club 3-segmented, more than thrice as long as wide (0.019:0.06), longer than preceding two funicle segments together.

Thorax (Fig. 59): Light brown with golden reflections on dorsum; pronotum (Fig. 60) with posterior margin slightly concave with seven pairs of setae, anterior margin concave in the middle; mesoscutum slightly less than two and a half times as long as wide (0.52:0.2); mesopraescutum with a single row of three bristles at each lateral margin, median furrow present; scutellum shorter than mesoscutum, with two submedian grooves and two pairs of setae; posterior margin rounded; mesopostphragma well developed, reaching beyond the propodeum, propodeum short, mesal length of propodeum almost one-third that of

scutellum, median carina wanting, spiracles large, almost contiguous with the anterior margin.

Forewings (Fig. 61): Hyaline, densely setose; more than twice as long as wide (1.18:0.51); costal cell broad, with 11 setae on the margin, basal vein with five setae; basal cell bare; speculum short and closed below; cubital vein straight; submarginal vein (0.34) with four setae, a trifle shorter than marginal vein (0.35); postmarginal vein (0.02) distinct; stigmal vein (0.13) less than one-third the length of marginal vein; fringe short, spaced by a distance equal to one-fourth their length.

Hind wings (Fig. 62): Hyaline, more than four times as long as wide (1.0:0.23) with blunt apex; marginal fringe almost one-third the wing width, spaced by a distance equal to one-sixth their length.

Legs: Yellow except coxae, margins of femora and pretarsus brown, hind coxae infuscated, middle tibial spur slightly shorter than basitarsus.

Abdomen: Light brown with a yellow patch in the middle of dorsum; as long as head and thorax together, ovipositor exerted; first valvifers (Fig. 63) semicircular; third valvulae (Fig. 63) very long, lanceolate, more than 10 times as long as wide, distinctly less than one-third the length of second valvifers (Fig. 63); outer plates of ovipositor (Fig. 63) almost as long as second valvifers.

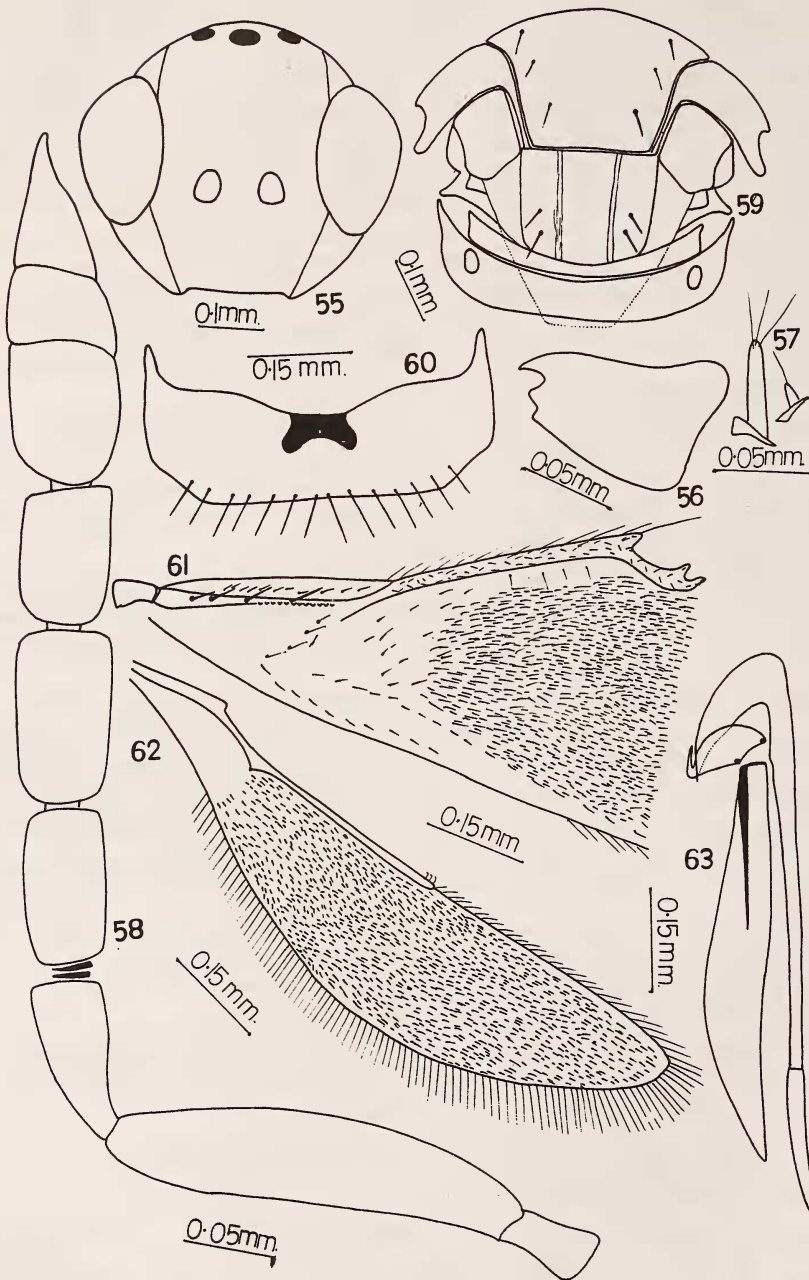
Length of female: 1.13 mm.

Male: Not known.

Material examined: Three females, INDIA, U.P. – Pantnagar, host not known, 9 July, 1988 (S.N. Sushil).

***Tetrastichus misellus* Delucchi**
(Figs. 64-74)

Head (Fig. 64): Yellowish except dorsum which is brown, wider than long in facial view (0.56:0.47); frontoververtex much wider, more than one-half the total head width (0.34:0.56); ocelli red, arranged in obtuse triangle, length of pos-



Figs. 55-63. *Tetrastichus lotellae* Delucchi
 55. Head, facial view; 56. Mandible; 57. Maxillary and labial palpi; 58. Antenna; 59. Thorax; 60. Pronotum;
 61. Forewing (part); 62. Hind wing; 63. Ovipositor.

to-cellar line more than twice as great as ocellular; eyes dark, smooth; antennae inserted well above the lower level of eyes; prominence between antennal sockets less than one-sixth the width of frons between eyes (0.06:0.34); malar space longer than eye width (0.15:0.11); malar suture distinct; lower margin of clypeus without dents medially; mandibles (Fig. 65) tridentate with acute teeth; maxillary and labial palpi each 1-segmented.

Antennae (Fig. 66): Brown except scape and apical tip of pedicel yellowish; scape cylindrical, more than five times as long as wide (0.28:0.05); pedicel more than twice as long as wide (0.05:0.04), distinctly less than half the length of first funicle segment; two ring segments present; funicle 3-segmented; first funicle segment very long, more than five times as long as wide (0.22:0.04), second (18:0.05) slightly longer than third funicle segment (0.17:0.05); club 3-segmented, less than five times as long as wide (0.25:0.55), distinctly shorter than preceding two funicle to last club segment with 7, 9, 9, 4, 6 and 5 sensoria respectively.

Thorax (Fig. 67): Brown with fine reticulate sculpture; pronotum (Fig. 68) with posterior margin slightly concave, with five pairs of setae; mesoscutum more than twice as wide as long (0.05:0.21), without middle longitudinal groove, mesopraescutum with eight pairs of setae arranged in two rather irregular rows at each lateral margin; each parapside with two setae; scutellum longer than wide (0.28:0.22), longer than mesoscutum, with two submedian grooves and two pairs of setae; metanotum band-like; propodeum with reticulate sculpture, mesal length of propodeum less than half the length of scutellum, propodeal spiracles separated from anterior margin by a space almost the length of a spiracle, strong mesal and paraspicular carinae present and a series of short carinae radiating latero-anteriorad from posterior margin; mesopostphragma not reaching beyond the propodeum; rudimentary petiole narrow.

Forewings (Fig. 69): Hyaline, almost

thrice as long as wide (1.8:0.61); densely setose; costal cell narrow, more than half the length of marginal vein (0.43:0.64), with eight setae arranged in a row; basal vein with three setae; basal cell bare; speculum large and open below; cubital vein straight; submarginal vein (0.41) with five setae; marginal vein very long (0.64), more than one and a half times the length of submarginal vein; postmarginal vein rudimentary; stigmal vein very short (0.07); five admarginal hairs present; marginal fringe short, spaced by a distance almost one-fourth length of a fringe.

Hind wings (Fig. 70): Hyaline, less than four times as long as wide; marginal fringe short.

Forelegs (Fig. 71): Uniformly yellowish except slight infuscation on apex, tibial spur short.

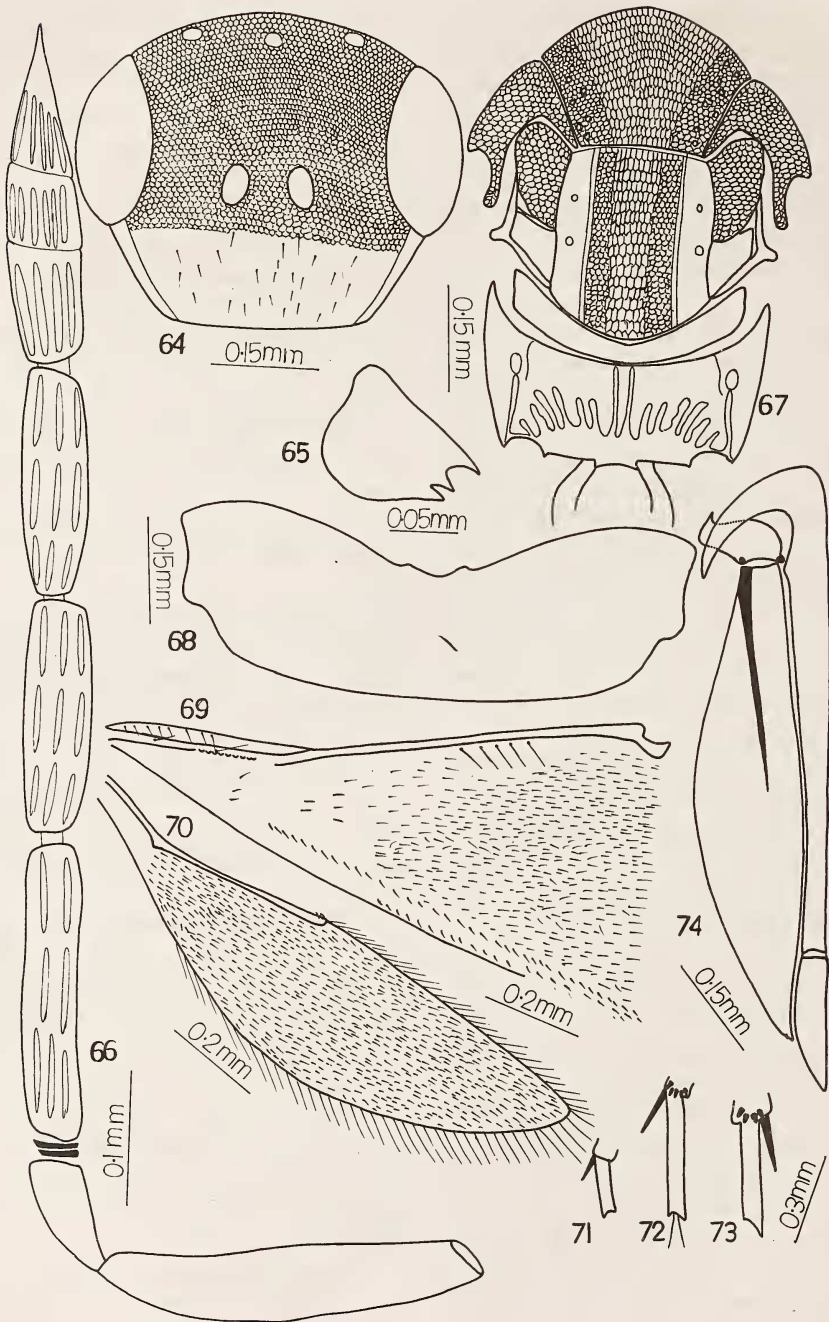
Middle legs (Fig. 72): Uniformly yellowish except coxa on greater part, third and fourth tarsal segments brown; apical rim of tibiae with five pegs; tibial spur short, less than half the length of basitarsus.

Hind legs (Fig. 73): Yellowish except coxae brown, last two tarsal segments infuscated; tibial spur more than half the length of basitarsus; apical rim of tibiae with four distinct pegs.

Abdomen: Brownish with golden reflections on dorsum; surface smooth; ovipositor slightly exerted, arising from basal one-third of abdominal venter; first valvifers (Fig. 74) semi-circular, with articular knobs prominent; third valvulae (Fig. 74) five times as long as wide, less than one-fourth the length of second valvifers (Fig. 74); outer plates of ovipositor (Fig. 74) as long as second valvifers; subgenital plate broad (Fig. 74), posterior margin with a notch in the middle.

Length of female: 1.3 mm.

Material examined: Eleven females, INDIA, U.P. — Nainital, Pantnagar, host not known, 19 August, 1987 (S. N. Sushil).



Figs. 64-74. *Tetrastichus misellus* Delucchi

64. Head, facial view; 65. Mandible; 66. Antenna; 67. Thorax; 68. Pronotum; 69. Forewing (part); 70. Hind wing; 71. Part of foreleg; 72. Part of middle leg; 73. Part of hind leg; 74. Ovipositor.

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